Audit Report

DOD REVIEW OF FLIGHT SAFETY CRITICAL THREADED FASTENERS AND COMPONENTS

Report No. D-2001-150 June 25, 2001

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Acronyms

DCMA	Defense Contract Management Agency
DLA	Defense Logistics Agency
FSC	Flight Safety Critical
NSN	National Stock Number
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics

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June 25, 2001

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS

SUBJECT: Audit Report on the DoD Review of Flight Safety Critical Threaded Fasteners and Components (Report No. D-2001-150)

We are providing this report for review and comment. This audit was performed in response to allegations to the Defense Hotline. We considered management comments on a draft of this report when preparing the final report.

DoD Directive 7650.3 requires that all recommendations be resolved promptly. Comments from the Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics did not adequately address the recommendations. We request that the Under Secretary of Defense for Acquisition, Technology, and Logistics reconsider its position, and provide additional comments on Recommendations 1., 2., 3., and 4., by August 22, 2001.

We appreciate the courtesies extended to the audit staff. Questions on the audit should be directed to Mr. Joseph P. Doyle at (703) 604-9349 (DSN 664-9349) (jdoyle@dodig.osd.mil). See Appendix C for the report distribution. The audit team members are listed inside the back cover.

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Report No. D-2001-150 **June 25, 2001**
(Project No. D2000CK-0197)

DoD Review of Flight Safety Critical Threaded Fasteners and Components

Executive Summary

Introduction. This audit was conducted in response to allegations made to the Defense Hotline in October 1999, that the DoD acquisition and quality assurance procedures allowed significant amounts of dimensionally nonconforming flight safety critical threaded fasteners and components into the DoD inventory. Similar allegations were made to the Under Secretary of Defense for Acquisition, Technology, and Logistics in April 1998 and October 1999. In response to the allegations, the Under Secretary initiated a "Joint Aerospace Threaded Fasteners/Components Review," of flight safety critical fasteners and components used by the Services. As a result of the review, the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics concluded on February 15, 2000, that DoD does not have a flight safety problem from nonconforming fasteners and components. We began our audit in April 2000 after the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics had finished their review and reported their results. This report discusses the adequacy of the Under Secretary of Defense for Acquisition, Technology, and Logistics review as it relates to the reliability of flight safety critical threaded fasteners and components in the DoD inventory. As of September 30, 2000, there were about 833 flight safety critical threaded fastener national stock numbers in the DoD inventory. We were unable to readily determine the number of flight safety critical threaded component national stock numbers in the DoD inventory.

Objectives. The overall audit objective was to determine whether the DoD "Joint Aerospace Threaded Fasteners/Components Review," February 15, 2000, adequately examined flight safety critical threaded fasteners and components used by the Services. See Appendix A for a discussion of the audit scope and methodology.

Results. The DoD Review was not comprehensive enough to support the conclusion that no flight safety problem existed with nonconforming fasteners and components in the DoD inventory. DoD only tested a sample of 19 different flight safety critical threaded fastener national stock numbers available in the Air Force inventory out of the 350 used by the Air Force and tested none of the flight safety critical threaded components used by the Air Force. The Air Force sample showed that 10 of the 19 national stock numbers tested, or 53 percent, had nonconforming flight safety critical threaded fasteners. Further, the review report did not disclose that the chief engineers responses to the Air Force letter on form, fit, and function on nonconforming fasteners showed that three of the six weapons systems chief engineers would not recommend accepting the nonconforming fasteners for use on their weapon system. DoD did not test any of the flight safety critical threaded fastener national stock numbers or any flight safety critical components in the Defense Logistics Agency, the Army, and the Navy inventories. In addition, although the quality assurance procedures used by the Defense Logistics Agency and the Services were reviewed, the implementation and results of those procedures were not verified to determine if they operated as intended. For details on the audit results, see the Finding section of the report.

Summary of Recommendations. We recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics develop uniform sampling and testing plans, test samples of flight safety critical threaded fasteners and components, document justifications for accepting tested nonconforming flight safety critical threaded fasteners and components, and analyze Defense Logistics Agency and the Services processes for accepting flight safety critical threaded fasteners and components.

Management Comments. The Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics reaffirmed the goal of assuring that the Department does not have a safety of flight problem related to the thread geometry of flight safety critical fasteners or components. However, he noted that the review of historical data did not identify a single incident or deficiency related to thread geometry of flight safety critical fasteners or components. The Principal Deputy therefore did not concur with the need to conduct further testing, but stated that the Joint Aeronautical Commanders Group has an ongoing effort to examine acquisition and quality assurance procedures for accepting flight safety critical items. A discussion of management comments is in the Finding section of the report, and the complete text is in the Management Comments section.

Audit Response. We disagree with the Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics position on testing. We do not believe that a review of historical data from incident reports was sufficient basis for concluding there were no potential problems. Only 19 of 833 (2 percent) of the flight safety critical threaded fastener national stock numbers were tested, and the review did not sample or test any flight safety critical threaded fasteners in the Defense Logistics Agency, Army, or Navy inventories nor any of the flight safety critical components. Most importantly, there were numerous nonconformances in just the few items tested, raising the distinct possibility that further testing would reveal more nonconformances. Thus, we believe that more needs to be done to ensure the integrity of the process used for acquiring the critical threaded fasteners and components.

We believe that the Joint Aeronautical Commanders Group tasking should be expanded to require more testing along with an analysis of the adequacy of the quality assurance procedures for accepting flight safety critical threaded fasteners and components. We request that the Under Secretary of Defense for Acquisition, Technology, and Logistics reconsider his position on the report recommendations and provide additional comments on the final report by August 22, 2001.

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Background

This audit was conducted in response to allegations made in October 1999, to the Defense Hotline, that the DoD acquisition and quality assurance procedures allowed significant amounts of dimensionally nonconforming flight safety critical (FSC) threaded fasteners and components (hereafter, referred to as FSC threaded fasteners and components) into the DoD inventory, resulting in flight safety hazards. Similar allegations were made to the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]) in April 1998 and October 1999. In response to the allegations, the USD(AT&L) initiated a "Joint Aerospace Threaded Fasteners/Components Review." The Office of the USD(AT&L) concluded on February 15, 2000, that DoD does not have a flight safety problem with dimensionally nonconforming fasteners and components. We began our audit in April 2000 after the Office of the USD(AT&L) had finished their review and reported their results.

Flight Safety Critical Threaded Fasteners and Components. Flight safety critical threaded items used in aerospace and other high technology applications consist of fasteners and components. A FSC threaded fastener is a nut or bolt, whose failure, malfunction, or absence could cause a catastrophic failure resulting in loss or serious damage to the aircraft. A FSC threaded component is a part of an assembly or combination of parts and subassemblies mounted together whose failure, malfunction or absence could cause a loss or serious damage to an aircraft or serious injury to the occupants.

As of September 30, 2000, the DoD inventory consisted of about 833 FSC threaded fastener national stock numbers (NSNs). We were unable to readily determine the number of FSC threaded component NSNs in the DoD inventory. Of the 833 NSNs, the Defense Logistics Agency (DLA) procured and managed 742 or about 90 percent of the DoD inventory. The Army procured and managed 90 FSC threaded fastener NSNs or 10 percent of the DoD inventory. The Navy relied on DLA to purchase and manage all but one FSC threaded fastener NSN that they used. The Air Force relied on DLA to purchase and manage all of the FSC threaded fasteners and components it used.

DoD Threaded Fastener/Component Review. In response to the April 1998 and October 1999 allegations, USD(AT&L) initiated a joint review with DLA and the Services to assess quality assurance procedures associated with the acquisition of FSC threaded fasteners and components, and the testing requirements of Military Standard 8879C (MIL-S-8879C). The DoD review included a sample of tested FSC threaded fasteners that were bought by DLA and in the Air Force inventory, and the procurement and quality assurance procedures used by DLA, the Army, the Navy and the Air Force. The DoD review also included the Services' mishap and deficiency reports, and aircraft incidents reported in the Government and Industry Data Exchange Program for the past 5 years.

Military Standard 8879C. Military Standard 8879C was the specific threaded fastener characteristic and measurement standard used to verify compliance of threaded fasteners to design specifications. On May 14, 1997, MIL-S-8879C was determined as not applicable for purchases of parts that were included in

new weapon system designs. However, any reprocurements of parts that were originally purchased using MIL-S-8879C, required the standard to be cited in follow-on acquisition documents.

Objectives

The audit objective was to determine whether the DoD "Joint Aerospace Threaded Fasteners/Components Review," February 15, 2000, adequately examined flight safety critical threaded fasteners and components used by the Services. See Appendix A for a discussion of the audit scope and methodology.

Flight Safety Critical Threaded Fasteners and Components

The DoD "Joint Aerospace Threaded Fasteners/Components Review," did not adequately examine FSC threaded fasteners and components used by the Services. The review was inadequate because DoD only tested a sample of 19 FSC threaded fastener NSNs available in the Air Force inventory. The review did not test any FSC threaded fasteners in the DLA, Army, or Navy inventories. The FSC threaded component NSNs in the DLA and Service inventories were not tested. In addition, the quality assurance procedures used by DLA and the Services were not verified as part of the DoD review. Further, the review report did not explain that three of the six weapons systems chief engineers would not recommend accepting the identified nonconforming fasteners for use on their weapon system. The DoD review was not comprehensive enough to support the conclusion that the DoD inventory does not have flight safety problems with dimensionally nonconforming FSC fasteners and components.

DoD Fastener/Component Review

The DoD review of FSC threaded fasteners and components conducted by the USD(AT&L) did not adequately examine the conformance of fasteners and components used by the Services and only relied on information from DLA and the Services. The review only sampled and tested 19 FSC threaded fastener NSNs in the Air Force inventory, and none of the FSC threaded fasteners available in the DLA, Army, or Navy inventories were tested. Instead, the DLA, Army and Navy submitted their purchasing and quality assurance procedures for keeping nonconforming FSC threaded fasteners and components out of the DoD inventories. However, those acquisition and quality assurance procedures were not verified or substantiated to determine that the procedures actually prevented nonconforming FSC threaded fasteners and components from entering DoD inventories. In addition, the review did not sample or test any FSC threaded component NSNs in the DLA and the Services inventories.

DoD Review Process

Sample. The DoD review of FSC threaded fasteners and components was inadequate because DoD used the test results from a sample of 19 FSC threaded fastener NSNs that were in the Air Force inventory as of December 1998. The Air Force initially selected 46 FSC threaded fastener NSNs for testing, and did not consider any components for testing. Testing was not conducted on 23 of the selected NSNs because no inventory was available. Four duplicate NSNs were also discovered on the remaining 23 FSC threaded fastener NSNs that had inventory available. The 19 NSNs sampled only consisted of 436 fasteners that were tested by the Air Force laboratory at Warner Robins Air Force Base, or one of the two independent laboratories selected by DLA.

The Air Force sample showed that 10 of the 19 NSNs tested, or 53 percent, had FSC threaded fasteners in the NSN that did not conform with requirements. Fasteners with test results outside of the pre-determined acceptable range specified in MIL-S-8879C were determined not in conformance with specifications. The Air Force Material Command stated that the test results were provided to Air Force weapons systems chief engineers responsible for the NSNs. All of the chief engineers concluded that the nonconformances were minor. In response to the Air Force questions on form, fit, and function, three of the six Air Force weapons systems chief engineers stated that they would not recommend accepting the fasteners with the known deviations for use on their weapon systems (T-38 jet trainer, F-5 fighter aircraft, UH-1N utility helicopter, and B-52 bomber aircraft). However, the Air Force Material Command review indicated that the results would not affect the form, fit, or function for which the fastener was intended and was suitable for use on their respective weapon systems. The Air Force Material Command could not adequately support their conclusion or provide documentation that the nonconformances did not affect the form, fit, or function of the FSC threaded fasteners. See Appendix B for details on the Air Force sample, testing plan, and results. In addition, DLA inventories were not considered for sampling and testing, even though DLA purchased and managed all of the Air Force FSC threaded fasteners and components.

Usage and Purchases of FSC Threaded Fasteners. The DoD uses 833 different FSC threaded fastener NSNs. The Army uses 327, the Navy uses 320, and the Air Force uses 350 FSC threaded fastener NSNs. DLA was responsible for the procurement of about 742 or about 90 percent of the 833 FSC threaded fastener NSNs that DoD used. The table below shows the number of FSC threaded fastener NSNs purchased by DLA and the Services.

Number of FSC Threaded Fastener NSNs Purchased by DLA and the Services

DLA	742
Army	90
Navy	1
Air Force	0
Total	**833**

Quality Assurance Procedures. DoD based its conclusions, that DLA and the Services quality assurance procedures were adequate for keeping nonconforming FSC threaded fasteners and components out of the DoD inventories, on unsupported information provided by DLA and the Services. DoD did not verify the quality assurance procedures. DoD did not require and DLA and the Services did not provide documentation that the procedures were adequate or operating as intended.

DLA Quality Assurance Procedures. DLA provided the USD(AT&L) with the acquisition and quality assurance procedures to be used to procure FSC fasteners and components. DLA stated that it used prequalified sources from the "Qualified Suppliers List Program." In addition, DLA provided a summary of the testing methods used to ensure only quality products were in DoD inventories.

DLA purchased about 523 out of the 742 FSC threaded fastener NSNs from manufacturers and suppliers that were prequalified by DLA or the Services. The Defense Contract Management Agency (DCMA) provides quality assurance during the initial stages when a contractor is qualified by performing quality checks of the contractor's manufacturing processes. We found that there were no scheduled reassessments of the prequalified manufacturers or suppliers by either DLA or the Services.

The remaining 219 FSC threaded fastener NSNs were purchased by DLA from manufacturers and suppliers that were not prequalified. DLA only conducted preshipment testing on a selected basis for those manufacturers and suppliers. In addition, DLA stated that they relied more on the integrity of the manufacturers' process controls in lieu of end of the line testing to deliver FSC fasteners and components that conformed to requirements. We concluded that DLA did not provide DoD with any documentation that showed that these procedures were adequate for preventing acceptance of nonconforming FSC threaded fasteners and components. For the FSC threaded fasteners NSNs purchased by DLA and used by the Services, the Services relied on DLA to provide them with conforming FSC threaded fasteners.

Problems with DLA's quality assurance over critical products were reported in an Office of the Inspector General, DoD, Report No. D-2001-054, "Defense Logistics Agency Product Verification Program," February 21, 2001. The report stated that DoD lacked sufficient assurance that some critical products would perform as expected. The DLA supply centers did not consider product criticality when DLA managed products were randomly selected for quality testing. The report also stated that for two of the three defense supply centers, test failures were not consistently investigated and required actions on test failures were not always taken. As a result, the two defense supply centers allowed potentially nonconforming products to remain available for issue.

Army Quality Assurance Procedures. The Army procured 90 of the 833 FSC threaded fastener NSNs used by DoD. The Army provided the USD(AT&L) with the quality assurance procedures they used to procure FSC threaded fasteners and components. The Army stated that periodic on-site audits and inspections of the contractors were conducted to verify the approved processes are maintained and to verify that FSC threaded fasteners and components met requirements. The Army FSC program required source inspection of 100 percent of all critical elements to ensure that only conforming items were entered into the Army inventory. The Army could not provide documentation showing that the testing was completed, and stated that it was the responsibility of DCMA to ensure that the contractors inspected all items before delivery.

Review Conclusions

DoD cannot adequately support its conclusion that the DoD inventory does not have flight safety problems with dimensionally nonconforming FSC fasteners and components. The review only included a limited test of FSC threaded fasteners in the Air Force inventory. None of the FSC threaded fasteners available in the DLA, Army, or Navy inventories were sampled or tested. The review did not include a sample or test of any FSC threaded component NSNs in the DLA and Services inventories. DoD should have verified the quality assurance procedures, including source inspection procedures, submitted by DLA and the Services to determine that the procedures actually prevented nonconforming FSC threaded fasteners and components from entering DoD inventories. In addition, DoD should have documented the justifications for accepting tested nonconforming flight safety critical threaded fasteners and components.

Summary

The DoD review of FSC threaded fasteners and components was inadequate to determine if significant quantities of nonconforming items were in DoD inventories. Also the DoD review was not adequate to determine whether nonconforming items presented safety hazards to operators of DoD weapons systems. To adequately determine whether DoD has problems with nonconforming FSC threaded fasteners and components, DoD should test a sample from the universe of FSC threaded fastener and component NSNs and include inventories from DLA and the Services. In addition, DoD should establish a uniform sampling and testing plan that is both reliable and projectable throughout DoD. Also, because of the uncertainty of the DLA and Services quality assurance procedures, DoD should independently verify their adequacy for excluding nonconforming items from DoD inventories.

Recommendations, Management Comments, and Audit Response

We recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics charter a working group with a time-phased plan to:

1. Develop uniform sampling and testing plans for determining sampling methods, testing procedures, and reliable and projectable results for use throughout DoD.

2. Test samples of flight safety critical threaded fasteners and components to determine the extent of nonconforming items in DoD inventories.

3. Document the justifications for accepting tested nonconforming flight safety critical threaded fasteners and components. The justification should include whether the part should be measured to a different specification or whether the part is no longer flight safety critical.

Management Comments. The Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics nonconcurred and stated that the Services, Defense Logistics Agency and Defense Contract Management Agency reviewed all reported flight incidents and accidents, as far back as 10 years, Product Quality Deficiency Reports and Government-Industry Data Exchange Program Alerts. The review of historical data did not identify a single incident or deficiency related to thread geometry of flight safety critical fasteners or components. Further, there was no basis at this time to expend scarce resources on testing additional fasteners or components.

Audit Response. We disagree with the Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics position. We believe the review of historical data of incident reports is not sufficient when 10 of the 19 national stock numbers tested, or about 53 percent, had nonconforming flight safety critical fasteners. This is a nonconformance rate that should be of concern when it relates to flight safety critical parts. The Defense Logistics Agency was responsible for procurement of about 90 percent of flight safety critical fastener national stock numbers that DoD used. The Defense Logistics Agency had procured the Air Force national stock numbers tested that had nonconforming flight safety critical fasteners. Further, only 19 of 833 (2 percent) of the national stock numbers were tested. The review did not sample or test any flight safety critical threaded fasteners in the Defense Logistics Agency, Army, or Navy inventories and no flight safety critical component national stock numbers were tested. The Defense Logistics Agency stated to us that they relied more on the integrity of the manufacturers' process controls in lieu of end of the line testing to deliver flight safety critical fasteners and components that conformed to all contractual requirements. There is no assurance that the remaining flight safety critical fastener national stock numbers in the DoD inventory do not have the same rate of nonconforming parts.

The Air Force review reported that the weapon systems chief engineers stated that the nonconformances would not affect the form, fit, or function for which the fastener was intended and was suitable for use on their respective weapon systems. However, our review of the chief engineers responses to the Air Force letter on form, fit, and function on nonconforming fasteners showed that three of the six Air Force weapons systems chief engineers (related to the T-38 jet trainer, F-5 fighter aircraft, UH-1N utility helicopter, and B-52 bomber aircraft) would not recommend accepting the fasteners for use on their weapon system. The responses from the other three Air Force weapons systems chief engineers stating that they would use the nonconforming fasteners indicates that some evaluation is needed to determine whether the part should be measured to a different specification or determine whether the part is no longer flight safety critical. We clarified the intent of Recommendation 3. based on Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics comments. We request that the Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics reconsider its position and provide additional comments when responding to the final report.

4. Analyze the Defense Logistics Agency and the Services adequacy of the acquisition and quality assurance procedures for accepting flight safety critical threaded fasteners and components from manufacturers and suppliers.

Management Comments. The Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics partially concurred stating that instead of establishing a separate group, they will monitor the Joint Aeronautical Commanders Group activities related to acquisition and quality assurance procedures for accepting flight safety critical items. The Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics would consider changes at a later date if the Joint Aeronautical Commanders Group recommends changes to acquisition and quality assurance procedures and the need for additional testing.

Audit Response. We believe that the Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics comments are partially responsive in that a separate working group does not have to be established for this area. However, we believe that the identified error rate for nonconforming flight safety critical fasteners warrants that the Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics require that the Joint Aeronautical Commanders Group analyze and test the adequacy of the acquisition and quality assurance procedures for accepting flight safety critical threaded fasteners and components from manufacturers and suppliers. We request that the Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics reconsider its position and provide additional comments when responding to the final report.

Appendix A. Audit Process

Scope and Methodology

Work Performed. The audit focused on the DoD "Joint Aerospace Threaded Fasteners/Components Review," February 15, 2000. We also reviewed the Air Force "Examination of Threaded Fasteners Identified as Flight Safety Critical, A Joint DLA/USAF Test Program," February 1, 2000, and other related documentation from DLA, and the Services. We interviewed cognizant officials at USD(AT&L), DLA, DCMA, the Army Aviation and Missile Command, the Navy Inventory Control Point, Philadelphia, and the Air Force Materiel Command.

DoD-Wide Corporate Level Government Performance and Results Act (GPRA) Coverage. In response to the GPRA, the Secretary of Defense annually establishes DoD-wide corporate level goals, subordinate performance goals, and performance measures. This report pertains to achievement of the following goal and performance measure.

> **FY 2001 DoD Corporate Level Goal 2:** Prepare now for an uncertain future by pursuing a focused modernization effort that maintains U.S. qualitative superiority in key warfighting capabilities. Transform the force by exploiting the Revolution in Military Affairs, and reengineer the Department to achieve a 21st century infrastructure **(01-DoD-2)**. **FY 2001 Subordinate Performance Goal 2.4:** Meet combat forces' needs smarter and faster, with products and services that work better and cost less, by improving the efficiency of DoD acquisition processes **(01-DoD 2.4)**.

General Accounting Office High-Risk Area. The General Accounting Office has identified several high-risk areas in the DoD. This report provides coverage of the Defense Inventory Management high-risk area.

Use of Computer-Processed Data. We did not rely on computer processed data to achieve the audit objectives.

Use of Technical Assistance. We obtained technical assistance from the Technical Assessment Division and the Quantitative Methods Division of the OAIG-AUD. We requested the Technical Assessment Division to review the Air Force test results and determine whether nonconformances found in the lots tested represented a significant nonconformance rate when related to flight safety critical parts. We requested the Quantitative Methods Division to review the Air Force sample selection methodology.

Audit Type, Dates, and Standards. We performed this economy and efficiency audit from April 2000 through January 2001 in accordance with auditing standards issued by the Comptroller General of the United States as implemented by the Inspector General, DoD. We did our work in accordance with generally accepted Government auditing standards except that we were unable to obtain an

opinion on our system of quality control. The most recent external quality control review was withdrawn on March 15, 2001, and we will undergo a new review.

Contact During the Audit. We visited and contacted individuals and organizations within DoD. Further details are available upon request.

Prior Coverage

The Inspector General, DoD, and the Inspector General, Department of Transportation have conducted reviews related to quality assurance issues. Inspector General, DoD, reports can be accessed on the Internet at http://www.dodig.osd.mil.

Inspector General, DoD

Inspector General, DoD, Report No. D-2001-054, "Defense Logistics Agency Product Verification Program," February 21, 2001.

Inspector General, Department of Transportation

Report No. AV-2001-003, "Oversight of Manufacturers' Quality Assurance Systems for Threaded Fasteners," October 11, 2000.

Appendix B. Air Force Test Plan, Sample, and Results

In response to allegations to the USD(AT&L) that the DoD acquisition and quality assurance procedures allow significant amounts of dimensionally nonconforming FSC threaded fasteners into the DoD inventory, resulting in flight safety hazards, USD(AT&L) tasked the Air Force in April 1998, to review its procedures for managing flight safety critical fasteners. The Air Force sampled and tested FSC threaded fastener inventories at repair depots located at Tinker Air Force Base, Oklahoma; Hill Air Force Base, Utah; Kelly Air Force Base, Texas; McClellan Air Force Base, California; and Warner Robins Air Force Base, Georgia. The Air Force did not sample or test FSC threaded fasteners or components at DLA distribution depots or inventories at Air Force non-repair depot facilities.

Test Plan. DLA purchased and managed all FSC threaded fasteners and components for the Air Force and maintained them in the DLA inventory until they were issued to Air Force units. The Air Force used the DLA Product Verification Program test plan for testing the FSC threaded fasteners. The tests included, but were not limited to, tests for hardness, thread geometry, and coatings, and required a minimum of 20 fasteners to be tested for each NSN. The minimum 20 fastener requirement was determined by a statistical model that DLA developed for use in random product testing.

Test Sample. The Air Force used its Wholesale and Retail Receiving and Shipping System (D035K Data Base System) to determine the locations and quantities of fastener inventories at Air Force Depots. The Air Force initially identified 93 different NSNs that showed FSC fasteners inventories on hand at Air Force depots. However, the Air Force then determined that only 46 of the 93 NSNs had the minimum 20-fastener requirement established. Subsequently, when the Air Force requested depot personnel to sample 20 fasteners for each of the 46 NSNs, they found that only 23 NSNs had any quantities of FSC threaded fasteners, and 4 of those NSNs were duplicate NSNs, resulting in 19 different types of FSC threaded fastener NSNs available for testing. The Air Force tested the 19 NSNs totaling 436 FSC threaded fasteners (3 NSNs had more than 20 fasteners tested).

The Air Force identified the universe of Air Force FSC threaded fasteners at the five repair depots. The Air Force selected a sample based on part availability with a minimum of 20 pieces at the repair depots. The remaining 23 NSNs were evaluated by reviewing original certification test documents dated between April 1992 and June 1999, provided by DLA.

Test Results. The 19 NSNs with sufficient quantities of FSC threaded fasteners were physically tested at the government laboratory at Warner Robins Air Force Base, Georgia; or at two commercial laboratories selected by DLA, Atlas Testing Laboratories, Los Angeles, California; or MMN Laboratories, Huntington Beach, California. According to the test plan, all measurements should have been calculated in accordance with MIL-S-8879C.

The following table shows that 10 of the 19 NSNs tested, or about 53 percent, had FSC threaded fasteners that were determined to be non-conforming with the requirements of MIL-S-8879C. We contacted the laboratory personnel at Warner Robins Air Force Base to determine how nonconforming FSC fasteners and components were accepted. The personnel stated that they determined a fastener acceptable when the test results were within the pre-determined acceptable requirements range specified in MIL-S-8879C. Items outside of that range were determined unacceptable to specifications.

FSC Threaded Fasteners Tested

Sample No.	National Stock No. 1/	Items Tested	Nonconforming Items in Lot 2/	Nonconforming Samples
CF-3	5306-00-068-0038	20	Yes	18
CF-4	5306-00-141-4513	20	Yes	19
CF-5	5306-00-150-3350	20	Yes	1
CF-6	5306-00-180-1739	20	Yes	3
CF-8	5306-00-208-3649	20	Yes	2
CF-10	5306-00-242-9262	20	No	0
CF-11	5306-00-283-0169	20	No	0
CF-13	5306-00-432-6114	20	No	0
CF-20	5306-00-901-4307	20	Yes	1
CF-21	5306-00-912-6805	20	Yes	18
CF-22	5306-00-912-6805 3/	11	No	0
CF-25	5306-01-023-9009	20	No	0
CF-28	5310-00-088-0552	20	No	0
CF-29	5310-00-123-2499	20	Yes	1
CF-32	5310-00-176-8112	20	Yes	12
CF-33	5310-00-176-8112 4/	20	Yes	12
CF-34	5310-00-176-8112 4/	20	Yes	11
CF-36	5310-00-638-5730	20	Yes	11
CF-37	5310-00-638-5730 5/	5	No	0
CF-39	5310-00-854-0675	20	No	0
CF-40	5310-00-882-0903	20	No	0
CF-41	5310-00-904-5786	20	No	0
CF-46	5310-01-274-2905	20	No	0
Total		**436**		**109**

1/ 23 NSNs with 4 duplicate NSNs equals 19 different NSNs.
2/ 12 lots had nonconforming parts however 2 lots were duplicate NSNs resulting in 10 different NSNs with nonconforming parts or about 53 percent (10/19).
3/ Duplicate NSN with CF-21
4/ Duplicate NSN with CF-32
5/ Duplicate NSN with CF-36

Appendix C. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition, Technology, and Logistics
- Deputy Under Secretary of Defense (Logistics and Materiel Readiness)
- Deputy Under Secretary of Defense (Acquisition Reform)
- Director, Defense Procurement

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- Deputy Chief Financial Officer
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Department of the Navy

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Auditor General, Department of the Navy

Department of the Air Force

Assistant Secretary of the Air Force (Financial Management and Comptroller)
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House Subcommittee on Government Efficiency, Financial Management, and Intergovernmental Relations, Committee on Government Reform
House Subcommittee on National Security, Veterans Affairs, and International Relations, Committee on Government Reform
House Subcommittee on Technology and Procurement Policy, Committee on Government Reform

Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics Comments

ACQUISITION AND TECHNOLOGY

PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE

3015 DEFENSE PENTAGON
WASHINGTON DC 20301-3015

MAY 2 2001

May 1, 2001

MEMORANDUM FOR DOD ASSISTANT INSPECTOR GENERAL FOR AUDITING

THROUGH: DIRECTOR, ACQUISITION RESOURCES AND ANALYSIS

SUBJECT: Draft Audit Report on the DoD Review of Flight Safety Critical Threaded Fasteners and Components (Project No. D2000CK-0197)

I am certain we both have the same goal of assuring that the Department does not have a safety of flight problem related to the thread geometry of flight safety critical (FSC) fasteners or components. I have re-examined the results from the prior DoD review and your report and found no evidence that this is a problem within the Department. I do partially concur with your findings and recommendations as addressed in Attachment 1. Attachment 2 provides comments addressing specific technical content in the report.

The Department considers acquisition and management of flight safety parts to be an extremely important process. We have moved away from "testing in quality" to ensuring that "quality is built in" through control of the part's key characteristics and process control. The manufacturers must demonstrate they have the necessary manufacturing processes and quality controls to continuously meet critical item characteristics. Given this, it is not necessary to duplicate testing already accomplished by the manufacturer.

While I do not concur with the recommendation to conduct further testing of FSC threaded fasteners and components at this time, I would agree we need to look at ways to continually improve our acquisition and quality assurance processes and procedures for flight safety parts. This is already being addressed by the Joint Aeronautical Commanders' Group (JACG) effort to examine the overall process for managing all flight safety critical parts. I have directed my staff to follow these efforts closely. If the findings and recommendations of the JACG initiative indicate that changes to the Department's acquisition practices for flight safety parts are needed or that testing is required, we will pursue this.

Dave Oliver

Attachments:
As stated

SUBJECT: DoD Review of Flight Safety Critical (FSC) Threaded Fasteners and Components, Project No. D2000CK-097

DoD IG Findings: DoD cannot support its conclusion that the DoD inventory does not have flight safety problems with dimensionally nonconforming Flight Safety Critical (FSC) fasteners and components. The review only included FSC threaded fasteners sampled and tested by the Air Force, and none of the FSC threaded fasteners available in the Defense Logistics Agency (DLA), Army, or Navy inventories. DLA and the Services also, did not sample or test any FSC threaded component national stock numbers (NSNs). In addition, the acquisition and quality assurance procedures, including source inspection procedures, submitted by DLA and the Services were not verified or substantiated to determine that the procedures actually prevented nonconforming FSC threaded fasteners and components from entering DoD inventories.

OUSD(AT&L) COMMENTS: Non-Concur that DoD cannot support its conclusion that the DoD inventory does not have flight safety problems with dimensionally nonconforming FSC fasteners and components. The report suggests DoD's conclusion is flawed because testing was limited to available samples in the Air Force inventory and because quality assurance procedures used were not verified or substantiated. The testing performed by the Air Force was not the primary basis for the conclusion that the Department does not have a safety of flight problem related to the thread geometry of FSC fasteners or components. The Air Force testing was performed to specifically address a previous accusation that the Air Force inventory contained FSC threaded fasteners with major nonconformances that posed a flight safety problem. The Air Force testing results provided confirmation for those FSC threaded fastener NSNs within their inventory that there were no major nonconformances nor flight safety problems.

The Services reviewed all reported flight incidents and accidents related to threaded fasteners and components as far back as ten years. The Services, DLA, and Defense Contract Management Agency (DCMA) also examined Product Quality Deficiency Reports (PQDRs) and Government-Industry Data Exchange Program (GIDEP) Alerts in order to determine if they had safety problems with FSC fasteners. There was not a single incident where failure of the thread geometry of threaded fasteners or components was the causal factor. This finding in conjunction with a review of DLA and Service acquisition and quality assurance processes that are used in the procurement of FSC threaded fasteners support DoD's conclusion.

DoDIG Recommendations: We recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics charter a working group with a time-phased plan to:

1. Develop uniform sampling and testing plans for determining sampling methods, testing procedures, and reliable and projectable results for use throughout DoD.

OUSD(AT&L) COMMENTS: Non-concur. The results of the review of historical data which included flight incidences, GIDEP Alerts and PQDRs as far back as ten years did not identify a single incident or deficiency related to thread geometry of FSC fasteners or components. There is no basis at this time to expend scarce DoD resources on testing additional fasteners or components.

Attachment 1

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2. Test samples of flight safety critical threaded fasteners and components to determine the extent of nonconforming items in DoD inventories.

OUSD(AT&L) COMMENTS: Non-concur. See rationale for recommendation 1.

3. Document the justifications for accepting tested nonconforming FSC threaded fasteners and components.

OUSD(AT&L) COMMENTS: Non-concur. See rationale for Recommendation 1.

4. Analyze DLA and the Services adequacy of the acquisition and quality assurance procedures for accepting FSC threaded fasteners and components from manufacturers and suppliers.

OUSD(AT&L) COMMENTS: Partially concur. Rather than establish a separate group to look at just thread geometry of FSC threaded fasteners and components, I have directed my staff to monitor the Joint Aeronautical Commanders Group (JACG) activities related to acquisition and quality assurance procedures for accepting FSC items. This group has already been established to look at the much broader category of flight safety parts to include such areas as identification and definition, management, the current acquisition process and quality assurance procedures, and disposal. Membership in the current group includes representatives from each of the Services, DLA, DCMA, Coast Guard, and the Federal Aviation Administration. If the JACG recommends changes to current acquisition and quality assurance procedures and the need for additional testing, I will consider them at that time.

Final Report Reference

OUSD(AT&L) Specific Comments
On the
Draft Audit Report on the DoD Review of Flight Safety Critical Threaded Fasteners and Components (Project No. D2000CK-0197)

The Office of the Under Secretary of Defense for Acquisition, Technology & Logistics (OUSD (AT&L)) has reviewed the Draft Audit Report on the DoD Review of Flight Safety Critical (FSC) Threaded Fasteners and Components (Project No. D2000CK-0197). The draft audit report draws on the results of a joint Air Force-Defense Logistics Agency (DLA) test program of Air Force stocks of flight safety critical threaded fasteners and components, reported in AFMC-EN/TR-00-01, "Examination of Threaded Fasteners Identified as FSC, A Joint DLA/USAF Test Program," February 1, 2000.

Revised

1. The third page, first paragraph, second sentence of the draft states that the DoD testing was on "a limited judgmental sample of 19 FSC threaded fastener national stock numbers (NSNs) available in the Air Force inventory."

> **Comment.** Most NSNs were not available in sufficient quantities in the Air Force inventory for sampling due to efficient just-in-time inventory practices. As a result, 23 lots were tested involving 19 different NSNs.

Revised

2. Appendix B, Air Force Test Plan, Sample, and Results, page 10, fourth paragraph, first sentence states, " However, the Air Force did not initially identify the universe of Air Force FSC… for selecting the samples."

> **Comment.** The Air Force initially identified the universe of FSC fasteners by working with the weapon system chief engineers.

Revised

3. Appendix B, Air Force Test Plan, Sample, and Results, page 10, fourth paragraph, third sentence states, "The Air Force used a judgmental sample based on part availability.., when making the sample selection."

> **Comment.** The NSNs sampled were based on availability of parts. The 20-piece sample size was statistically derived and mirrors the DLA sampling approach. In a number of cases, the entire bin population was collected in order to achieve the 20-piece sample size.

Deleted

4. The third page, last paragraph entitled "Limited Judgmental Sample", second sentence states, "These [the Air Force] test results inappropriately conclude that the Air Force and DoD inventories did not contain…nonconforming…threaded fasteners and components".

> **Comment.** The conclusions reached by the Air Force inventory testing addressed the question of flight safety. The final conclusion was that "there is no evidence of a safety problem as a result of out-of-tolerance readings in the current Air Force stock."

5. *Appendix B, Air Force Test Plan, Sample, and Results*, page 10, first paragraph, second sentence states, "The Air Force only sampled… inventories at... depots located at... Tinker Air Force Base... Hill Air Force Base... McClellan Air Force Base and Warner Robins Air Force

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Final Report Reference

Base."

Comment. The Air Force also tested samples collected from Kelly Air Force Base in San Antonio, TX. — Revised

6. *Appendix B, Air Force Test Plan, Sample, and Results*, page 10, first paragraph, third sentence states, "The Air Force did not consider sampling… at Air Force non-repair depot facilities." — Revised

Comment. Non-repair depots contacted reported that they had no critical stock available in their bins.

7. *Appendix B, Air Force Test Plan, Sample, and Results*, page 11, first paragraph, last sentence states, "According to the test plan, all measurements should have been calculated in accordance with MIL-S-8879." — Revised

Comment. The test plan used MIL-S-8879C for thread geometry measurements and also included 13 tests involving other standards as part of the total assessment.

- Visual inspection for pits, nicks, burrs, etc.
- Dimensional inspection, i.e. length, width, thickness, etc.
- Hardness testing per hardness specs
- Tensile testing per tensile specs
- Double shear testing per shear specs
- Tension fatigue testing per fatigue specs
- Stress durability testing per stress specs
- Coating inspection including plating, paint, dry lubes, etc.
- Plating thickness inspection per plating spec
- Solid film lube inspection
- Chemical analysis to identify material type
- Magnetic Particle analysis to inspect for cracks, bursts, etc.
- Cross section and Micro Etch to determine grain flow

8. The fourth page, second paragraph, first sentence incorrectly states, "…13 of the 19 NSNs tested, or 68 percent, were nonconforming…." Also, *Appendix B, Air Force Test Plan, Sample, and Results*, page 11, second paragraph, first sentence states, "The following table shows that 13 of the 19 NSNs, accounting for 300 of the 436...or about 68.8 percent…were determined to be nonconforming with the requirements of MIL-S-8879C." — Revised

Comment. The attached Figure 1 shows the correct numbers from the Joint DLA/USAF Test Program report compared to the numbers in the DoD IG draft audit report. According to the Joint DLA/USAF Test Program report, 106 of the 436 fasteners tested (or 24.3 percent) were found nonconforming with the test plan requirements. Please correct these statements and the data on page 12 of the draft audit report using the test data from the Joint DLA/USAF Test Program report included below in Figure 1, FSC Threaded Fasteners Tested.

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Revised

Figure 1: FSC Threaded Fasteners Tested							
	Sample No	NSN	Items Tested	Nonconforming Items		Percent	
				DoD IG	AF	DoD IG	AF
1.	CF-3	5306-00-063-0038	20	20	18	100	90
2.	CF-4	5306-00-141-4513	20	20	19	100	95
3.	CF-5	5306-00-150-3350	20	20	1	100	5
4.	CF-6	5306-00-180-1739	20	20	2	100	10
5.	CF-8	5306-00-208-3649	20	20	0	100	0
6.	CF-10	5306-00-242-9262	20	0	0	0	0
7.	CF-11	5306-00-283-0169	20	0	0	0	0
8.	CF-13	5306-00432-6114	20	0	0	0	0
9.	CF-20	5306-00-901-4307	20	20	1	100	5
10.	CF-21	5306-00-912-6805	20	20	18	100	90
11.	CF-22	5306-00-912-6805	11	0	0	0	0
12.	CF-25	5306-01-023-9009	20	20	0	100	0
13.	CF-28	5310-00-088-0552	20	0	0	0	0
14.	CF-29	5310-00-123-2499	20	20	1	100	5
15.	CF-32	5310-00-176-8112	20	20	12	100	60
16.	CF-33	5310-00-176-8112	20	20	12	100	60
17.	CF-34	5310-00-176-8112	20	20	11	100	55
18.	CF-36	5310-00-638-5730*	20	20	11	100	55
19.	CF-37	5310-00-638-5730*	5	0	0	0	0
20.	CF-39	5310-00-854-0675	20	0	0	0	0
21.	CF-40	5310-00-882-0903	20	20	0	100	0
22.	CF-41	5310-00-904-5786	20	0	0	0	0
23.	CF-46	5310-01-274-2905	20	20	0	100	0
Totals			436	300	106	68.8	24.3
* - DoD/IG identified the NSN as "5013-00-638-5730" instead of "5310-00-638-5730".							

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Audit Team Members

The Contract Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, prepared this report. Personnel of the Office of the Inspector General, DoD, who contributed to the report are listed below.

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